



Town of Jackson

Geotechnical Data Report Budge Drive Landslide Jackson, Wyoming



LANDSLIDE
TECHNOLOGY
A DIVISION OF CORNFORTH CONSULTANTS

Town of Jackson
150 East Pearl Avenue
Jackson, Wyoming 83001

GEOTECHNICAL DATA REPORT
BUDGE DRIVE LANDSLIDE
JACKSON, WYOMING

JULY 3, 2014

Submitted by:

Landslide Technology
10250 SW Greenburg Road, Suite 111
Portland, OR 97223

TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 Background	1
1.2 Scope of Work.....	1
2. SITE RECONNAISSANCE and OBSERVATIONS.....	3
2.1 Ground Cracks and Landslide Displacement	3
2.2 Landslide Movement Monitoring.....	4
2.3 Structures.....	4
2.4 Utilities	5
2.5 East Gros Ventre Butte Upper Slope.....	5
3. EMERGENCY MITIGATION MEASURES	6
4. GEOTECHNICAL INVESTIGATIONS	7
4.1 Review Available Data.....	7
4.2 Subsurface Explorations.....	8
4.3 Supplemental Explorations.....	8
4.4 Instrumentation.....	9
4.4.1 Slope Inclinometers	9
4.4.2 Vibrating Wire Piezometers.....	9
4.5 Laboratory Testing	9
4.5.1 Classification	9
4.5.2 Ring Shear Testing.....	9
4.5.3 Atterberg Limits.....	10
5. GEOLOGY AND SUBSURFACE CONDITIONS	11
5.1 Regional Geology.....	11
5.2 Site Geology	11
5.2.1 Surface Conditions.....	11
5.2.2 Subsurface Conditions (Exploration Borings).....	12
5.3 Groundwater.....	13
5.4 Slide Movement	13

5.4.1	Slope Inclinometers	13
5.4.2	Ground Surface Extensometers	15
5.4.3	Survey Monitoring Points	15
6.	LANDSLIDE INTERPRETATIONS	16

LIST OF FIGURES

1. Vicinity Map
2. Site Map – East Gros Ventre Butte
3. Site Plan
4. Landslide Photo
5. Geologic Map
6. Geologic Cross-Section 1
7. Geologic Cross-Section 2
8. Geologic Cross-Section 3
9. Geologic Cross-Section 4
10. Geologic Cross-Section 5
11. Geologic Cross-Section 6
12. Geologic Cross-Section 7
13. Geologic Cross-Section 8
14. Landslide Movement Map

APPENDICES

- Appendix A Summary Boring Logs and Core Photographs
- Appendix B Photographs
- Appendix C Instrumentation Data: Inclinometers and Piezometers
- Appendix D Vibrating Wire Piezometer Calibration Sheets
- Appendix E Laboratory Test Results
- Appendix F Survey Monitoring Plots
- Appendix G Ground Surface Extensometer Plots
- Appendix H Summary Test Pit Logs and Photographs

1. INTRODUCTION

This report presents the results of subsurface explorations, laboratory testing, geologic reconnaissance and observations of the Budge Drive Slide located near the intersection of West Broadway Avenue in Jackson, Wyoming, as shown on the Vicinity Map and the Site Map of Gros Ventre Butte, Figures 1 and 2, respectively. The landslide is located at the foot of the south-facing slope of East Gros Ventre Butte. West Broadway Avenue is a primary access route (US 26) on the south side of Jackson.

1.1 Background

The south-facing slope of East Gros Ventre Butte is comprised of talus and colluvial deposits. The upper slope is relatively steep and the lower area becomes gently sloped. The lower part of the butte slope was formerly a rock quarry and has undergone several phases of development and grading over the last 50 years.

Ground distress, which may have been associated with initial landslide movement, was reportedly detected in late 2011 in the residence (#1045 Budge Drive) located on the hillside bench upslope of the old quarry cut face. In 2013, it became apparent that significant lateral ground movement was occurring between the residence and the old quarry, based on observations of ground cracks and survey measurements.

On March 31, 2014, following significant rainfall and snowmelt, bulging and cracks were detected in the parking lot north of the Walgreens building. Cracks in the driveway, garage, and surrounding ground surface of the residence upslope of the old quarry cut face also appeared to enlarge. A headscarp was visible and lateral scarps defined the east-west limits of the slide. The incoming waterline in the pump station developed a leak on April 4, and was subsequently repaired. Between April 6 and 7, a waterline leak occurred along Budge Drive upslope of the pump station. Water flowed into the street until the waterline was shut off at the pump station. A temporary above ground waterline was installed. Cracking and displacement of concrete curbs and asphalt pavement occurred along Budge Drive and towards the intersection with West Broadway Avenue. On April 9, 2014, Walgreens suspended its operations and the Town of Jackson (Town) closed vehicle access to Budge Drive issuing an evacuation for the safety of residents and businesses. The gas utility line along the north side of Broadway Avenue was also shut off in the vicinity of the landslide.

The landslide was affecting one residence (#1045) upslope, Budge Drive and its retaining wall, the Hillside Plaza east parking areas and structure, and a newly developed Walgreens parking lot and perimeter retaining wall.

1.2 Scope of Work

The Town contacted Landslide Technology (LT) on April 8, 2014 and requested geotechnical assistance. A senior engineer from LT arrived onsite on April 10, 2014 and performed a

preliminary evaluation of landslide conditions and provided geotechnical guidance to the Town's emergency response.

The goal of the landslide emergency response work was to advise the Town on slowing the rate of movement, performing an investigation, including the installation of instruments to monitor the landslide, and providing the Town with conceptual mitigation options.

The scope of work for the investigation included the following work items:

Review Available Information. Reports, maps, and construction records were reviewed for information pertaining to local and regional geology, slope stability, and groundwater.

Assist in Emergency Slide Mitigation. Advised the Town and recommended placement of material for construction of an emergency buttress to slow the rate of movement of the landslide.

Subsurface Explorations and Instrumentation. Landslide Technology mobilized a drilling company on April 21, 2014 to conduct a subsurface investigation and to install instrumentation. Five borings (LT-1 through LT-5) were drilled, including three through the landslide body and two outside the active limits to evaluate materials and estimate landslide geometry. Slope inclinometers were installed in each boring to determine depth and rate of movement. Instrumentation in borings outside the landslide was installed to confirm extents of movement and provide early warning in the event the slide expands. Piezometers were installed in each boring to measure groundwater levels and determine hydrostatic pressures acting near the basal shear zone of the landslide.

Supplemental Explorations and Instrumentation. Landslide Technology mobilized a drilling company on June 16, 2014 to conduct a supplemental subsurface investigation and to install instrumentation north of the Walgreens building. Two borings (LT-6 and LT-7) were drilled, with one in the landslide toe bulge and the other outside the bulge next to the building. Slope inclinometers were installed in each boring to determine depth and rate of movement. An extensometer cable was also installed in LT-6 to permit continued measurements of slide movement after the inclinometer casing becomes obstructed due to progressive slide movement. Piezometers were installed in each boring to measure groundwater levels and determine hydrostatic pressures acting near the basal shear zone of the landslide.

Geologic Reconnaissance. Geologic reconnaissance was completed across the landslide and its perimeter, as well as on rock outcrops on East Gros Ventre Butte above the landslide.

Laboratory Testing. Laboratory testing consisted of ring shear residual strength tests, Atterberg Limits tests, and verification of soil classifications.

Office Tasks. Office tasks included preparation of summary boring logs and geologic sections, reduction of groundwater and instrumentation data, evaluation of ground surface monitoring data, and preparation of this summary report.

2. SITE RECONNAISSANCE and OBSERVATIONS

Initial mapping of landslide cracks, bulges and displacement of pavement and curbs was surveyed by Jorgensen Associates of Jackson, Wyoming. The initial Landslide Technology reconnaissance on April 10, 2014 included the observation of ground cracks, bulges and displacement of pavement and curbs to evaluate the extent of the landslide and to interpret slide mechanisms. The reconnaissance included the areas immediately adjacent to the boundary of active landslide features. Subsequent reconnaissances were performed to observe the progression of landslide movement and its effects (April 11 through May 9, 2014). The significant landslide features are shown on the Site Plan, Figure 3, the Landslide Photo, Figure 4, and various photos in Appendix B.

On May 8, a reconnaissance was performed upslope of the slide area to the top of East Gros Ventre Butte to evaluate it as a potential source area for displaced slide blocks and talus.

Observations were augmented with Jorgensen's survey monitoring measurements of selected points, as well as ground surface extensometers provided by Dr. Roger Bilham of the University of Colorado.

2.1 Ground Cracks and Landslide Displacement

Cracks (scarps) occurred around the perimeter of the active landslide and within the graben (upper portion of the landslide). Bulged ground and pavement was indicative of the landslide toe (developing a passive pressure wedge) in Budge Drive, Walgreens west and north parking areas, and Hillside Plaza east parking areas. Cracks, rockfall and raveling from the old quarry cut face were indicative of active ground deformation as the landslide moved.

The observed displacement of the landslide increased, culminating in significant landslide movement and raveling of the old rock quarry face over April 17-18, 2014. The landslide moved approximately 6-10 feet in one day during the most active period.

Surface cracking increased from the initial small cracking and displacement of concrete curb and asphalt pavement to significant horizontal displacement of curbs along lower Budge Drive and near the intersection of Budge Drive and West Broadway Avenue. Some of the distressed pavement pushed and displaced the more rigid concrete curbs. The toe bulge in the Walgreens parking lot pavement and to the north of the Walgreens building showed increased deformations.

Cracks were observed in the upper parking area and structure east of the Hillside Plaza, and pavement distress and bulging was observed on the eastern end of the lower parking area.

After the very active landslide movement (April 17-18, 2014), the headscarp continued to develop down-dropping midway through the upslope residence (#1045), causing a portion of the house to fall into the graben. Additional cracking was evident underneath the residence #1045 in the crawl space north (upslope) of the headscarp. These cracks opened up to approximately 1.5-

inches and were continuous along the west-east length of the house. These cracks appear to line up with the cracking in the driveway pavement, garage and east exterior foundation of the house.

Lateral scarps along the east and west boundaries of the landslide expanded. A reverse scarp formed approximately 70 to 140 feet from the headscarp, indicating the presence of a graben. The reverse scarp developed about midslope of the quarry face near the westerly landslide limits and progressed upwards towards the center of the landslide to the top of the old quarry cut face (shown approximately on Figures 3 and 4).

2.2 Landslide Movement Monitoring

Observations were supplemented with survey monitoring measurements of selected points, which were surveyed by Jorgensen Associates. Landslide Technology reviewed the survey monitoring data and developed graphs to display relative movement trends, which were used to determine if the landslide was accelerating or decelerating and to verify the observed extents of the active landslide. Graphs of apparent ground movement based on the survey monitoring are presented in Appendix F.

Dr. Roger Bilham from the University of Colorado and Wallace Ulrich of Jackson, Wyoming volunteered to install ground surface extensometers at four locations near the headscarp. The extensometers are Dual Range Extensometers manufactured by Deformetrics. The extensometers consist of a stainless steel wire connected to an anchor point via a carbon rod on the distal end that pass through two precision measurement wheels at the datalogger end. The wheels are connected to a continuous range transducer and a ten-turn potentiometer. The former provides precision while the latter provides ultimate displacement. The dataloggers are set to read at five-minute intervals. Two of these locations monitored displacement between the headscarp and the graben (E-1 and E-3), one location measures displacement between a mid-point on the graben and the north edge of the reverse scarp (E-2), and the other location (E-4) measures displacement of cracks located in the Budge residence driveway. The east extensometer (E-1) is currently uploading data every three hours using wireless cellular signal. Current plots from the ground surface extensometers are located in Appendix G.

2.3 Structures

The residence (#1045) at the headscarp was damaged by differential displacement of its foundations, which straddled across the landslide headscarp. A portion of the house collapsed into the down-dropped graben as a result of landslide movement. The other residential structures in the vicinity of the landslide have not shown signs of distress and nearby survey points have not detected slide movement upslope or outside the mapped extents of the active landslide.

The Town's water pump station located on the east side of Budge Drive near the intersection with West Broadway Avenue was displaced and rafted in the slide mass forcing a pressure bulge in the earth towards West Broadway Avenue. The pump station was damaged by the landslide and was subsequently decommissioned and equipment salvaged.

The movement of the landslide toe caused the Walgreens sign to rotate towards West Broadway Avenue, and a portion of the retaining wall along the southwest edge of the parking lot became deformed.

The Walgreens building has not shown signs of movement or distress; however, curbs and pavement on the north side of the building exhibit cracks, displacement, deformation and bulging. The building floor slab is founded on 5 feet of rockfill underlain with geogrid. Recent survey and inclinometer measurements indicate the possibility of movement very close or at the north building wall; however, more measurement monitoring is needed to evaluate the possibility of movement at this wall location.

The parking structure along the southerly portion of the second parking level east of the Hillside Plaza showed cracking and distress. The property owner initiated temporary mitigations and restricted parking in this area.

2.4 Utilities

Utilities along Budge Drive were relocated, including the waterline, sewer and gas line. The waterline had experienced leaks due to landslide movement. The relocated waterline is a flexible 2-inch diameter HDPE pipe, capable of withstanding small deformations.

The sewer mainline pipe along West Broadway Avenue was video surveyed, and no distress was detected. Nearby inclinometer LT-1 (a few feet to the north of the sewer pipe) detected very small tilt deformation in the upper 7 feet (approximately 0.09 inch in one month).

One power pole east of the upslope residence #1045 had moved and tilted, and subsequently the powerline was rerouted on the ground to avoid this power pole.

2.5 East Gros Ventre Butte Upper Slope

The native slope above the landslide area transitions from a gently-inclined bench upon which the houses were constructed, to approximately 30-40 degrees further upslope. The crest of the slope has outcrops of very highly jointed basaltic andesite with unfavorable dip orientations. Dip directions in these basaltic andesite outcrops were generally inclined to the south. In addition, some of the rim rock lining the crest is inflated and may pose future rockfall hazards to the residences, businesses and roadways downslope of the crest. Distinct trough and bowl features were observed at the slope crest and along the steeper sections suggesting an older scarp area. This older scarp supports the interpretation that the rock debris found in the slide mass may have originated upslope in geologic time. Talus on the upper slope directly above the active landslide area consists almost exclusively of the basaltic andesite blocks and debris found in the active landslide mass. To the east and west of the active landslide, mixed lithologies (different rock types) are encountered in the talus.

3. EMERGENCY MITIGATION MEASURES

The immediate mitigation measures undertaken in the vicinity to restore access to upper Budge Drive and reduce hazards to properties included the following:

- Repair to the incoming waterline in the pump station.
 - The waterline along Budge Drive was shut-off at the pump station after a leak was detected and a temporary pipe was installed on the ground surface to provide water in the event of emergencies.
 - The main sewer pipe along the north side of West Broadway Avenue was surveyed daily with a video camera until landslide movements slowed down and an instrument was installed in geotechnical boring LT-1.
 - The waterline feeding the pump station was shut off to prevent further leaks from developing. Additional shut-off valves were installed in the mainline along West Broadway Avenue.
 - Placement of approximately 8,000 tons of concrete, sand and gravel was conducted to build an emergency buttress along Budge Drive, at the south and east of the Hillside parking structure, and onto the former site of the pump station and the western edge of the Walgreens parking lot. This helped to slow down landslide movement.
 - The temporary surface waterline was relocated during construction of the buttress along Budge Drive. A replacement temporary waterline to the Budge Drive neighborhood was rerouted to the west of the active landslide limits.
 - The powerline was rerouted on the ground to bypass the power pole that had moved/tilted east of the upper residence (#1045).
 - Re-arrangement of concrete blocks, L-wall segments, jersey barriers and sand/gravel backfill to straddle the cracked and distressed portion of Budge Drive to restore road use.
 - Relocation of the temporary waterline within the new temporary roadway after slide movements decreased.
 - The Budge Drive sewer line was rerouted to the west of the active landslide.
 - Sandbags were placed along a short section of upper Budge Drive to divert surface runoff from flowing onto the landslide.
 - The upper parking area east of the Hillside Plaza was closed and the restaurant installed instruments to monitor for basement wall deformations.
 - Warning signs (landslide and rockfall hazard) were placed at both ends of the gravel-surfaced segment of Budge Drive.
- Landslide movement monitoring within and outside of the active landslide area: survey points, inclinometers, and ground surface extensometers.

4. GEOTECHNICAL INVESTIGATIONS

The geotechnical investigations and office studies included the following tasks:

- Review available information, plans and maps
- Conduct geologic reconnaissance
- Perform subsurface explorations and install instrumentation
- Perform laboratory testing

4.1 Review Available Data

A geologic literature search was completed to collect existing data for the project site. Available reports included:

- “Geology of the Teton – Jackson Hole Region, Jackson Quadrangle, Teton County, Wyoming,” Map LMS-9, Love, David J., and Albee, Howard F., Wyoming State Geological Survey (in cooperation with US Geological Survey), 2004.
- “Topographic Map of the Jackson Quadrangle”, USGS, 1963.
- “Topographic Map of the Jackson Quadrangle”, USGS. 2001.
- “Roadside Geology of Wyoming,” Lageson, David R., and Spearing, Darwin R., Mountain Press Publishing Company, 2009.
- “Field Guide to the Quaternary Geology of Jackson Hole, Wyoming,” Pierce, Kenneth L., and Good, John D., (1992) March 2000.
- Historical Air Photographs, Teton County GIS Map Website
<http://maps.greenwoodmap.com/tetonwy/mapserver/>
- “Geotechnical Site Investigation, Hillside Property and Gros Ventre Drive Improvement, Jackson, Wyoming”, Womack & Associates, Inc., May 1, 2001.
- “The Hillside Subdivision Infrastructure Improvements Project”, Conformed plan sheets, September 10, 2001.
- “Geotechnical Investigation Report, New Walgreens Store and Residential Building, Lot 11, Hillside Subdivision,” Womack & Associates, Inc., December 13, 2012.
- “Geotechnical Investigation and Consultation, Budge Residence, 1045 Budge Drive, Jackson, Wyoming”, Project No. DN46,799-145 Report, CTL Thompson Inc., December 16, 2013.
- Budge Residence Inclinator plots, CTL Thompson Inc., April 15, 2014.
- “Seismicity and Earthquake Hazard Analysis of the Teton-Yellowstone Region, Wyoming”, B. J. Pickering White, et al, Journal of Volcanology and Geothermal Research, Elsevier, 2009.

The local geology was discussed with members of the Geologists of Jackson Hole and with representatives of the Wyoming State Geological Survey.

4.2 Subsurface Explorations

Subsurface explorations for this investigation consisted of five borings, designated LT-1 through LT-5. The borehole locations are shown on Figure 3. LT-1 was drilled along the sidewalk of West Broadway Avenue east of Budge Drive. LT-2 was drilled east of Budge Drive near the entrance to the Walgreens lot from Budge Drive. LT-3 was drilled between Budge Drive and the Hillside Plaza upper parking area near the western extent of the landslide. LT-4 was drilled in the graben of the slide, north of LT-2. LT-5 was drilled north of the headscarp between residence properties #1040 and #1045. Summary Boring Logs and Core Box photographs are presented in Appendix A.

The drilling was performed between April 22 and May 8, 2014 by HazTech Drilling, Inc. of Meridian, Idaho using a CS-1000 track-mounted drill rig (see photographs, Appendix B). An engineering geologist from our firm was present during the drilling to coordinate the work, collect and log samples and to direct installation of instrumentation. The borings were advanced using HWT casing advancer and HQ3-wireline coring techniques.

4.3 Supplemental Explorations

Two additional borings were drilled in the eastern portion of the landslide toe, north of the Walgreens building. These borings are designated LT-6 and LT-7. In addition, two test pits were excavated in the toe bulge near the northwest corner of the Walgreens building. The borehole and test pit locations are shown on Figure 3. LT-6 was drilled in the toe bulge near the north side of the parking area behind the Walgreens building. LT-7 was drilled a few feet north of the Walgreens building. Summary Boring Logs and Core Box photographs are presented in Appendix A.

The drilling was performed June 17 and 19, 2014 by HazTech Drilling, Inc. of Meridian, Idaho using a CME 850 drill rig. An engineering geologist from our firm was present during the drilling to coordinate the work and collect and log samples and to direct installation of instrumentation. The borings were advanced using HWT casing advancer and HQ3-wireline coring techniques.

The two test pits were excavated on June 20 using a Komatsu PL 308 hydraulic excavator operated by Westwood Curtis. The test pits were made to depths of 20 to 25 feet below the AC parking lot pavement grade. The purpose was to identify the geometry of the shear zone in the passive wedge landslide toe. Summary test pit logs and photographs are presented in Appendix H.

4.4 Instrumentation

4.4.1 Slope Inclinometers

Durham Geo Slope Indicator 2.75-inch diameter slope inclinometer (SI) casing was installed in each boring. The casing has machined grooves to guide the inclinometer probe so that measurements can be collected every two feet. Accelerometers in the probe measure tilt on two axes and a connected Datamate records the reading for comparison against previous reading sets. Two initial reading sets were taken upon completion of each boring. The cement-grout used for installation usually takes 2-3 days to cure, which sometimes causes the casing alignment to shift, and therefore readings in the first few days may show these effects. Subsequent reading sets were made to determine ground deformations, the depths of the landslide shear zone, and the corresponding rates of movement. Deflection and time displacement plots are presented in Appendix C.

4.4.2 Vibrating Wire Piezometers

Geokon model 4500S vibrating-wire piezometers (VWP) were installed in each boring to measure groundwater pressure. The VWPs were attached to the side of 2.75-inch O.D. slope inclinometer casing and then grouted in place using a cement-bentonite mixture. Each vibrating wire piezometer is attached by instrument cable to a data logger recording readings every 30 minutes. The data loggers record changes in water pressure acting on the VWP. Three of the borings (LT-2, LT-4 and LT-5) had a second VWP installed at alternate depths. VWP serial numbers, sensor depths, and other installation details are given on the Summary Boring Logs. Water-level data is shown in Appendix C. The calibration sheets for each VWP are included in Appendix D.

4.5 Laboratory Testing

Laboratory testing was completed on selected samples collected during drilling to aid in determining engineering and index properties. All testing was performed in Landslide Technology's laboratory.

4.5.1 Classification

Samples collected during the investigation were re-examined by Landslide Technology at the Town of Jackson Public Works to confirm field descriptions. Results of classification have been incorporated into the Summary Boring Logs.

4.5.2 Ring Shear Testing

Ring shear strength tests were conducted on two samples obtained from near the basal shear zone in boring LT-4. Atterberg limit tests were performed on all ring shear samples. Ring shear specimens consisted of fat clay to silty clay. Results of the ring shear tests were compared to generally-accepted empirical relationships between index properties (Atterberg limits) and

residual strength. Empirical relationships included those proposed by Stark and Eid (1994) and Voight (1973).

Testing procedures were in general accordance with ASTM D-6467. Each specimen was remolded into the ring-shear apparatus. Tests were performed with normal pressures of approximately 3 to 6 tons per square foot (tsf). Following consolidation, samples were generally pre-sheared at a rate of 0.09 inch/min (126 inches/day), for approximately 5 to 15 minutes. Following pre-shear the displacement rate was reduced to 0.0007 inch/min (1 inch/day) and allowed to run until reaching residual strength (usually a period of at least 12 hours and sometimes as much as two days). The test results are based on the higher 6 tsf normal stress loading since it more closely resembles the in-situ pressure at the basal shear zone. Results are presented in Appendix E. Residual shear strength tests indicated an effective residual friction angle ϕ_r , as follows:

- Light gray CLAY, LT-4 depth 136.5 feet: $\phi'_r = 12.4^\circ$
- Dark gray Silty CLAY, LT-4 depth 137.4 feet: $\phi'_r = 15.0^\circ$

The sample at depth 136.5 feet was predominantly a highly plastic, light gray clay seam (approximately 1/8 inch thick), with some effect of the adjoining silty clay. It was not possible to completely separate out the highly plastic clay from the adjoining material. In our opinion, the actual residual shear strength of the light gray clay seam is likely lower than the test result shown.

4.5.3 Atterberg Limits

Liquid and plastic limits were determined for the same samples near the LT-4 shear zone that were used in the ring shear tests in general accordance with ASTM D 4318 laboratory test procedures. Results of the Atterberg limits tests are presented in Appendix E, and are summarized below:

- Light gray CLAY, LT-4 depth 136.5 feet: Plasticity Index (PI) = 25%
Liquid Limit (LL) = 50%
- Dark gray Silty CLAY, LT-4 depth 137.4 feet: Plasticity Index (PI) = 24%
Liquid Limit (LL) = 45%

In addition, Atterberg Limits were determined on a sample from test pit LT-TP-1 obtained from the landslide shear zone in the toe bulge. Results are presented in Appendix E, and are summarized below:

- Black Silty CLAY, LT-TP-1 depth 12 feet: Plasticity Index (PI) = 27%
Liquid Limit (LL) = 44%

Based on plots of the Atterberg limits test results on the Plasticity Chart in Appendix E, the light gray clay seam is classified as CL/CH, and the dark gray silty clay is classified as CL (Unified Standard Classification System, USCS).

5. GEOLOGY AND SUBSURFACE CONDITIONS

5.1 Regional Geology

The Budge Drive slide is located on the south face of East Gros Ventre Butte in the Wyoming Thrust Belt. The geology of the region is defined by Tertiary volcanics and Quaternary to Precambrian sedimentary units. Pleistocene glaciation shaped many of the valleys and sediment deposits in the region. The bedrock in the area consists of gray basalt (basaltic andesite), the Shooting Iron Formation (that contains weak claystones, tuffaceous sandstones and conglomerates), and various older limestones and mudstones. Regional uplift and spreading have elevated the Teton Range and exposed the older folded Laramide orogeny.

The geologic map (Figure 5) by Love and Albee, 2004, indicates that the bedrock in the vicinity of Budge Drive slide is Tertiary Shooting Iron sedimentary rock and Bacon Ridge Sandstone. However, based on the petrology of hand and core specimens collected during our investigation, it appears that the rocks encountered are from the Tertiary volcanics as well as possibly a sedimentary unit that was not identified in the geologic map.

5.2 Site Geology

Geologic units encountered at the slide site, listed from youngest to oldest, include the following: fill, colluvium, loess, landslide debris, alluvium and lacustrine deposits, weak sedimentary rocks, conglomerate, and basaltic andesite. Subsurface material conditions may be different than those exposed on the ground surface, and therefore are described in separate subsections of this report. A brief discussion of each geologic unit is given below. The subsurface conditions and landslide geometry are represented on a series of geologic cross-sections (Figures 6 through 13). The locations of the geologic cross-sections are shown on the Site Plan, Figure 3.

5.2.1 Surface Conditions

The following materials were identified during surface reconnaissance in the vicinity of the active landslide:

Fill. Fill material types vary by location. At the Budge residence, fill consists of Medium stiff, slightly clayey silt with numerous gravel- to cobble-sized rock fragments, which was placed to level the building site. Fill materials in Budge Drive and the parking areas consist of asphaltic concrete and crushed aggregate. In the emergency buttress, fill consists of concrete, silty sandy gravel and cobbles.

Colluvium. Colluvium consists of angular talus intermixed with soft slightly clayey silt. The talus, particularly outside the active slide limits has mixed lithology of basaltic andesite, conglomerate, limestone, breccia, and rhyolite. Within and directly upslope of the active slide, talus is predominantly basaltic andesite.

Loess. The loess consists of soft slightly clayey silt with trace fine sand intermixed.

Basaltic Andesite. The basaltic andesite encountered in outcrops and the steep quarry face is typically hard (R4), gray, slightly to moderately weathered, fine-grained. It is very highly jointed and fractured on average. The basaltic andesite exhibits minor to trace columnar jointing and flow orientations. The basaltic andesite exposed in the quarry face appears to be a displaced landslide block.

Conglomerate. The sedimentary material observed to the west of the active landslide consists of very soft to soft (R1 to R2), gray to brown, moderately weathered with sand to gravel-sized clasts. It is highly to moderately fractured in the outcrop to the west of the project site.

Landslide Debris. Slide debris encountered includes mixing and weathering of the previously described materials at the locations encountered.

5.2.2 Subsurface Conditions (Exploration Borings)

Materials encountered in the drill samples include the following:

Fill. Fills at the boring locations were relatively shallow and were not sampled.

Loess. Soft, slightly clayey silt. Many depositions of loess are found in the region from different geologic times. Relatively thin overburden layer of unconsolidated wind-deposited material was encountered in borings LT-4 and LT-5. Loess encountered in boring LT-2 is beneath the active basal shear zone and may have been deposited in an older geologic setting. The loess in boring LT-2 is medium stiff slightly clayey silt.

Terrace Deposit. Medium dense to dense, silty, sandy gravel was encountered near the surface in boring LT-1. It is uncertain if and how much fine materials exist because much of the fines were washed away due to the drilling method used.

Landslide Debris. A mix of various weathered and displaced materials due to mass movement.

Colluvium/ Debris Flow. Stiff slightly clayey to clayey silt was encountered in borings LT-1, LT-2, LT-3, and LT-4 below the active landslide basal shear zone elevation. The soil contains numerous angular sand to gravel-sized rock fragments, mostly of basaltic andesite, and a few cobble-sized fragments.

Alluvium. Medium dense to dense sand and gravel were encountered in borings LT-1, LT-2, and LT-4 below the active landslide shear zone. The alluvium consists of well-rounded to subrounded sand and gravel of varied lithology.

Basaltic Andesite (Slide Debris). Basaltic andesite was encountered in borings LT-3, LT-4, and LT-5 which has been displaced, deformed, and highly rubblized from ancient landslide motion. The slide mass contains large blocks of highly fractured basaltic andesite and areas of more broken/rubblized rock fragments which is indicative of significant movement, compression and extension (dilation). The basaltic andesite is hard (R4), gray, slightly weathered. It is very highly to highly fractured and jointed where encountered in block form. Less rubblized zones

have a slightly clayey silt infilling that may be loess in origin.

Conglomerate (Slide Debris). The conglomerate is extremely soft (R0), brown, decomposed, very highly to highly fractured. The decomposed conglomerate encountered in boring LT-4 has been displaced, deformed, and is very highly rubblized from ancient landslide motion. In borings LT-2 and LT-3, the conglomerate is mixed with colluvium slide debris. Conglomerate near the basal shear zone has been reduced to slightly clayey to clayey silt and sheared, indicative of weathering and significant movement.

Interbedded Mudstone/Claystone Grading to Sandstone. Extremely soft to soft (R0-R2) dark gray to gray, interbedded mudstone/claystone grades to fine sandstone. There are bedding planes present that are dipping gently as in a deltaic environment. Numerous faulted zones show offset and displacement. The offsets appear tectonic in nature due to relatively high angles and offsets observed. Bi-valve shells, turbid structure, and healed fractures, and hydrogen sulfide odors are also present in various zones. The presence of slickensides on high angle fractures and healed zones suggest these are related to tectonic movements in geologic time.

5.3 Groundwater

Groundwater levels recorded in May show relatively low water pressures acting at the shear zone. Measured groundwater levels above the basal shear zone are approximately 2 and 8 feet of water head in borings LT-2 and LT-4, respectively. The low water heads observed may be due to the low precipitation for the month of May 2014. The rainfall total for the month at the time of this report is under 0.5-inch. Plots for all piezometers and rainfall are located in Appendix C. The groundwater levels are probably higher during spring snowmelt and significant rainstorms.

5.4 Slide Movement

Slide movement has been detected both by surficial and in-ground instruments. Movement has been quantified since the start of monitoring. Survey monitoring and extensometers measure displacements at the ground surface. Inclinometers measure the depth of subsurface ground deformations, the landslide shear zone location, and the amount of displacement. Rates of ground movement (landslide velocity) can be calculated from the measured data, which is useful for detecting possible accelerations or decelerations in landslide movement. Figure 14 shows relative current rates of movement as determined by the various methods of monitoring for selected instrument/survey point locations.

5.4.1 Slope Inclinometers

The seven slope inclinometers installed onsite offer the most reliable and accurate measurements of ground deformations and the displacement along the landslide basal shear zone. The plots in Appendix C show specific depths, rates and total movement amounts. A summary of the movements follows:

- LT-1 is located near the intersection of Budge Drive and West Broadway Avenue and is showing slight earth pressure displacement in the upper 8 feet due to the slide toe bulge exerting pressure on adjacent ground. The current rate of tilt displacement is approximately 0.002-inch per day (July 1, 2014).
- LT-2 is located east of Budge Drive north of the former pump station and has shown significant movement and may soon be unreadable due to the magnitude of landslide shear displacement. The landslide has displaced the inclinometer casing nearly 2-inches at a depth of 22-24 feet below ground surface (approximate shear zone elevation 6153 to 6155 feet) since monitoring began. The rate of shear zone displacement was approximately 0.06-inch per day (May 20, 2014) and subsequently this inclinometer casing has become obstructed from slide movement. The casing has been abandoned and converted to a borehole extensometer. The instrument may be initialized and connected to a data logger at a future date.
- LT-3 is located south of Budge Drive near the upper parking area for the Hillside building. The old shear zone is interpreted to be at approximately 37 feet below ground surface (elevation 6155). To date (July 3, 2014), no discernable movement has been detected in LT-3.
- LT-4 is located within the landslide graben and has shown significant movement due to landslide shear. The landslide has displaced the inclinometer casing nearly 1-inch at a depth of 135.7-137.7 feet below ground surface (approximately shear zone elevation 6154 to 6156 feet) since monitoring began. The rate of shear zone displacement was approximately 0.04-inch per day (June 3, 2014) and subsequently this inclinometer casing has become obstructed from slide movement. The casing has been abandoned and converted to a borehole extensometer. The instrument may be initialized and connected to a data logger at a future date.
- LT-5 is upslope of the landslide headscarp and confirms there is no discernable landslide movement at that location (through July 1, 2014).
- LT-6 is within the toe bulge near the north limits of the parking lot behind the Walgreens building and has detected shear displacement in the landslide toe (passive wedge) at a depth of 17-19 feet below ground surface (approximate shear zone elevation 6167 to 6169 feet). Since this boring is in the landslide passive wedge, the elevation of the basal shear zone may be deeper under the central block of the landslide. The current rate of displacement is approximately 0.13-inch per day (between June 20 and July 1, 2014).
- LT-7 is located a few feet north of the Walgreens building and is showing slight displacement in the upper 7 feet due to the slide toe bulge. The current rate of displacement is approximately 0.014-inch per day (between June 20 and July 1, 2014).

5.4.2 Ground Surface Extensometers

The four extensometers installed on the ground surface near the headscarp and graben offer repeatable data that measures displacements across ground cracks in the graben and headscarp. Appendix G contains plots of this data. A summary of the movement follows:

- E-1 (east headscarp) is showing a current rate of movement of approximately 0.06-inch per day.
- E-2 (within graben) is showing a current rate of movement of approximately 0.10-inch per day.
- E-3 (west headscarp) is showing a current rate of movement of approximately 0.01 to 0.05-inch per day.
- E-4 (driveway to residence #1045) has not shown discernable movement across the cracks in the pavement since monitoring began.

5.4.3 Survey Monitoring Points

Survey points have been monitored during the past year, and frequently since April 1, 2014. Survey points have been added and removed as the landslide evaluation progressed. Plots of representative monitoring points are included in Appendix F. Survey readings can vary by up to a half inch, and therefore more significant readings are usually necessary before being confident in the accuracy of the measurement and whether it represents real movement or survey error. Monitoring points outside the mapped landslide boundaries show no discernable movement.

Survey points on the western half of the landslide toe show approximate current movement rates under 0.1-inch per day while survey points in the eastern half of the landslide toe show movement rates between 0.1-inch and 0.2-inch per day.

6. LANDSLIDE INTERPRETATIONS

The geometry of the landslide was interpreted through several key factors. Observations of surficial landslide headscarp and lateral scarp features, slope conditions, landslide toe features, and evaluations of inclinometer displacements and survey monitoring data were used to interpret the limits and geometry of the landslide. The landslide appears to be a nearly horizontal translational slide with the graben (active wedge) pushing against the translational, central block.

The location of the headscarp upslope of the old quarry face maximizes the size and weight of the graben, which maximizes the driving force applied to the active landslide.

The depth and shape of the basal shear zone was interpreted from detailed inclinometer readings, appearance and location of the headscarp and reverse scarp (graben width), and interpretation of conditions encountered in the borings. The basal shear zone is located at approximately 6155-ft elevation, which is about 11-ft below the elevation of West Broadway Avenue.

The geometry of active and passive landslide wedges was based on the appearance and width of the graben and the extent of bulging at the landslide toe. Since the basal shear zone is deeper than the slide toe area, a bulge forms as an expression of the passive wedge.

On the west boundary of the active landslide, the lateral scarp stops about 30 feet upslope of the Budge Drive retaining wall, and no cracks were evident in the pavement nor has movement been detected in the inclinometer in boring LT-3. A toe bulge appeared near the southeast corner of the parking structure, indicating that the west lateral scarp passes partway through the upper parking area and parking structure.

The central portion of the landslide toe affects the eastern parking area of the Hillside property, Budge Drive, the former pump station, and the western parking lot of Walgreens. The landslide toe appears to not extend to the sewer and waterline in West Broadway Avenue; however, the landslide toe passive wedge (toe bulge) appears to slightly push the ground near these utilities (based on measurements of very small tilt in the upper 7 feet of inclinometer LT-1).

A zone of colluvial material (based on LT-7, LT-TP-1 and LT-TP-2) appears to be present under the Walgreens building near the eastern portion of the landslide toe that may be influencing the shape of the toe. Based on the expression of the toe bulge north of Walgreens, the basal shear zone appears to be shallower than in the middle landslide toe area (LT-2) and is smaller in lateral extent.

Landslide characteristics include the following:

- Estimated Size: 450-ft wide, 300-400-ft long, up to 140-ft deep
- Approximate volume: 7 million cu ft (270,000 cu yds)
- Approximate weight: 470,000 tons

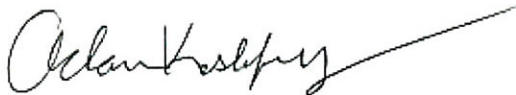
Groundwater acting along the basal shear zone creates buoyancy which reduces slide resistance. In addition, groundwater in the graben and headscarp contributes to driving forces (due to

buoyant effects on the active block). Significant rainfall events, particularly rain on snow, and spring snowmelt can increase groundwater levels typically in short durations, which decreases slide stability.

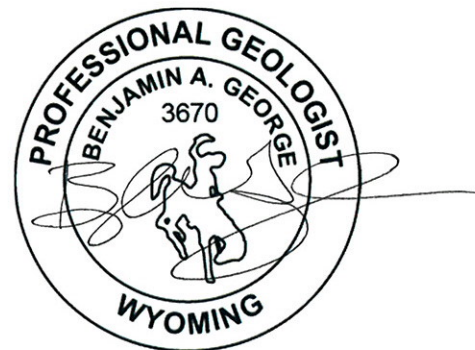
Figure 14 shows movement rates across the slide, which are based on measurements made since mid-May 2014. Measurements on the western half of the landslide toe show approximate current movement rates under 0.1-inch per day, while measurements in the eastern half of the landslide toe show movement rates between 0.1-inch and 0.2-inch per day. It appears that the temporary buttresses on both sides of Budge Drive have helped to reduce movements in the westerly portion of the landslide. Since the landslide is still moving, the level of stability, expressed as a Factor of Safety, is less than equilibrium (driving forces exceed resisting forces).

We trust the information contained in this geotechnical data report is sufficient for your current requirements. If you have questions or need additional information, please call the undersigned at 503-452-1200.

LANDSLIDE TECHNOLOGY

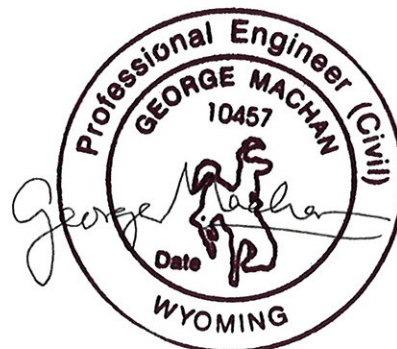


Adam Koslofsky,
Project Geologist



Reviewed by: Benjamin George, PG
Associate Geologist

George Machan, PE
Senior Associate Engineer



Limitations in the Use and Interpretation of this Geotechnical Report

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject facility and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive boring and test pit logs, cross-sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory borings, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory borings and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

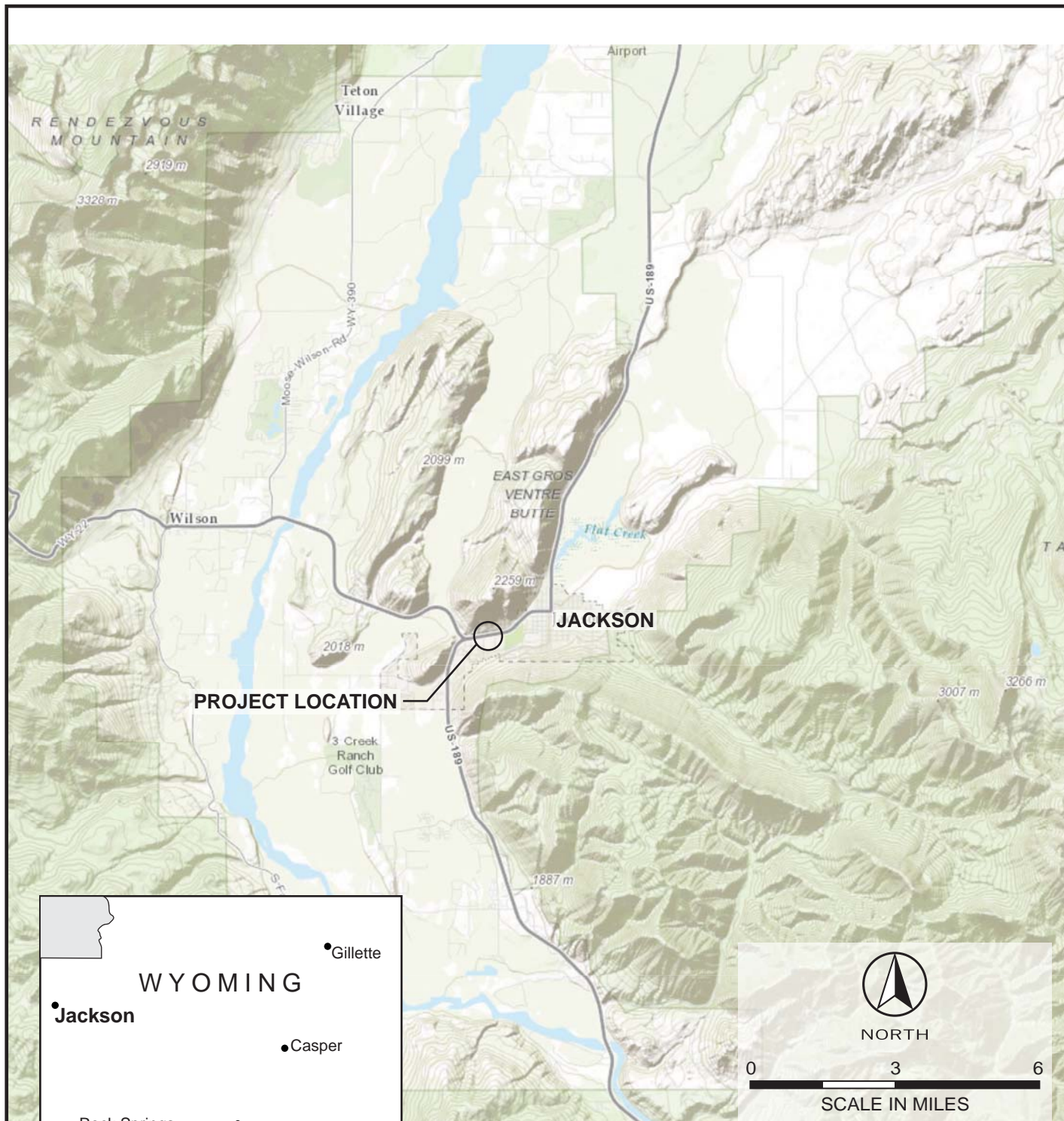
The Summary Boring Logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the borings progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The boring logs and related information depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, borings or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report; nor can our firm be responsible for any construction activity on sites other than the specific site referred to in this report.



SOURCE: ESRI, DELORME, NAVTOQ, TOMTOM, INTERMAP, INCREMENT P CORP., GEOBCO USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, AND THE GIS USER COMMUNITY



**LANDSLIDE
TECHNOLOGY**

A DIVISION OF CORNFORTH CONSULTANTS
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Main 503-452-1200 Fax 503-452-1528

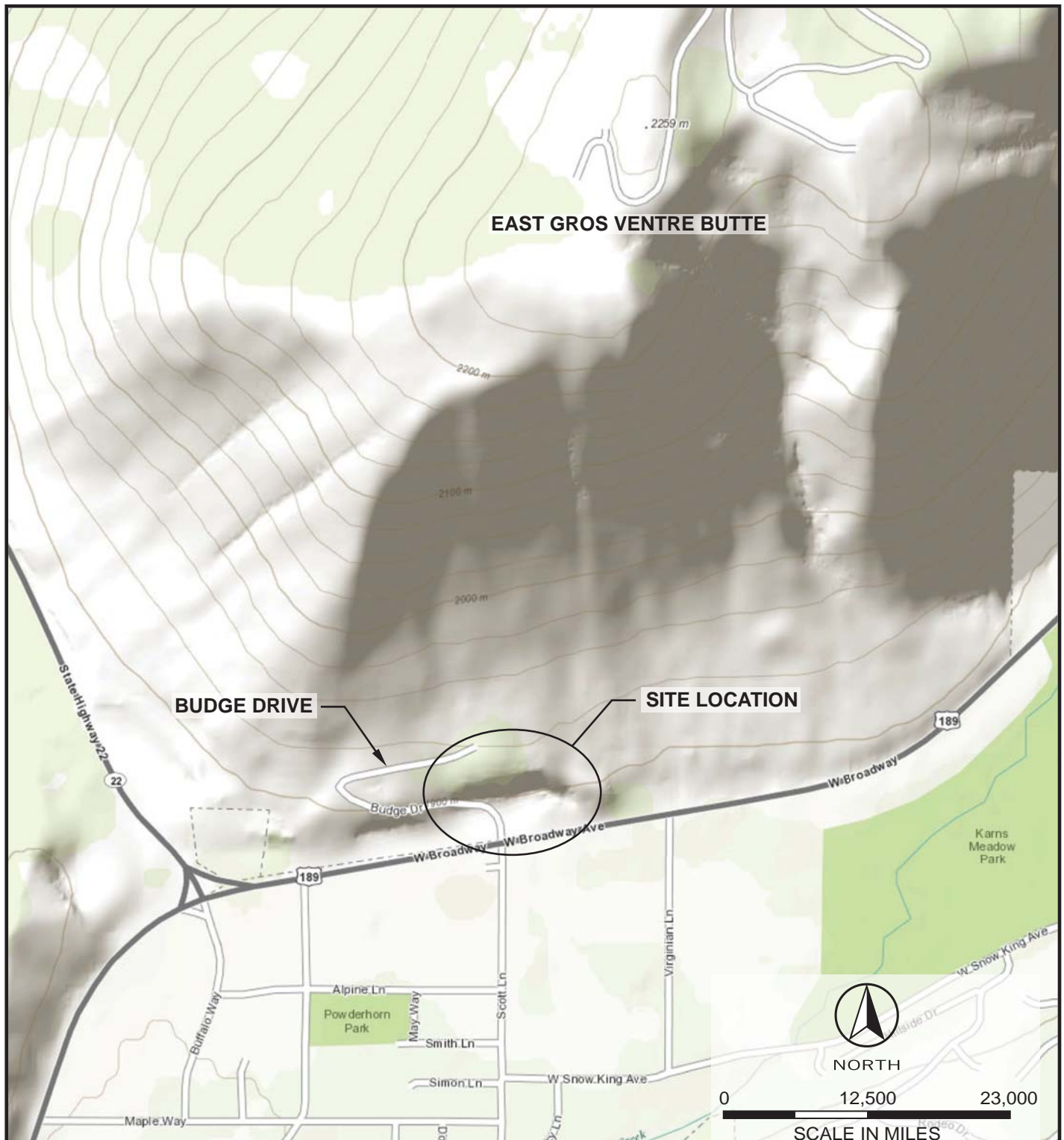
VICINITY MAP

BUDGE DRIVE SLIDE
JACKSON, WYOMING

MAY 2014

PROJ. 2354

FIG. 1



SOURCE: ESRI, DELORME, NAVTOQ, TOMTOM, INTERMAP, INCREMENT P CORP., GEOBCO USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, AND THE GIS USER COMMUNITY



**LANDSLIDE
TECHNOLOGY**

A DIVISION OF CORNFORTH CONSULTANTS
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Main 503-452-1200 Fax 503-452-1528

2354/02.AI NAU

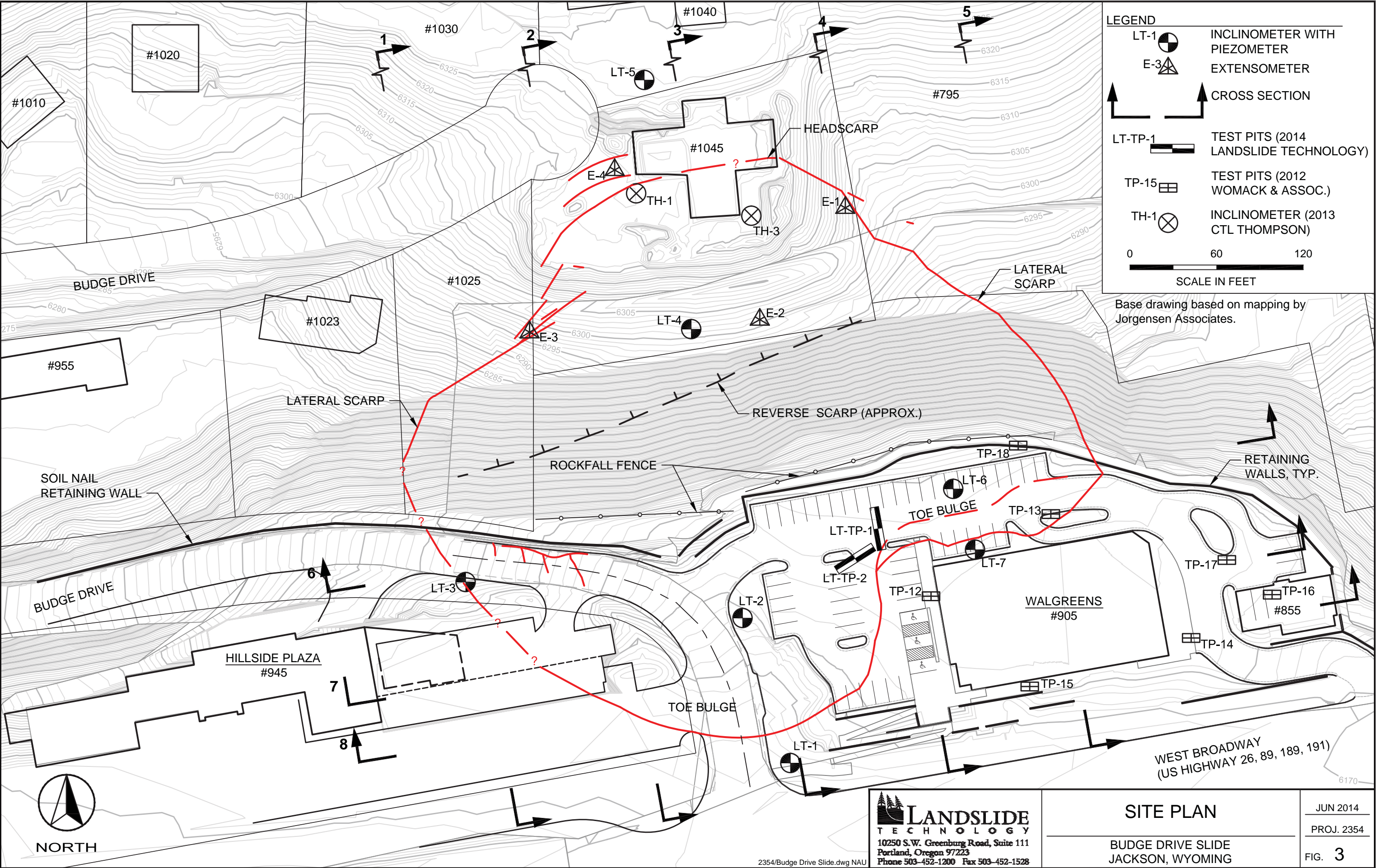
SITE LOCATION

**BUDGE DRIVE SLIDE
JACKSON, WYOMING**

MAY 2014

PROJ. 2354

FIG. **2**



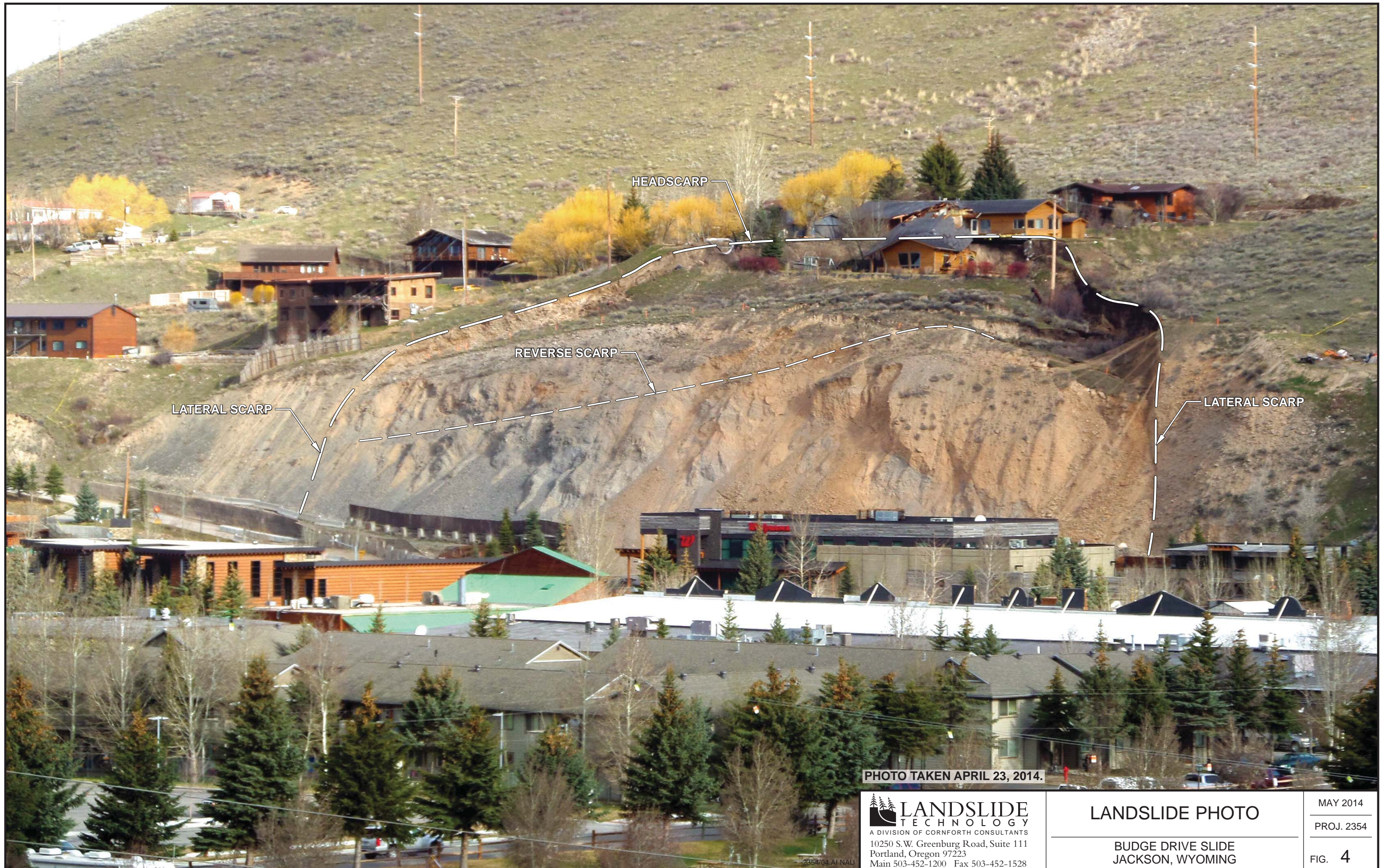


PHOTO TAKEN APRIL 23, 2014.

LANDSLIDE TECHNOLOGY
A DIVISION OF CORNFORTH CONSULTANTS
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Main 503-452-1200 Fax 503-452-1528

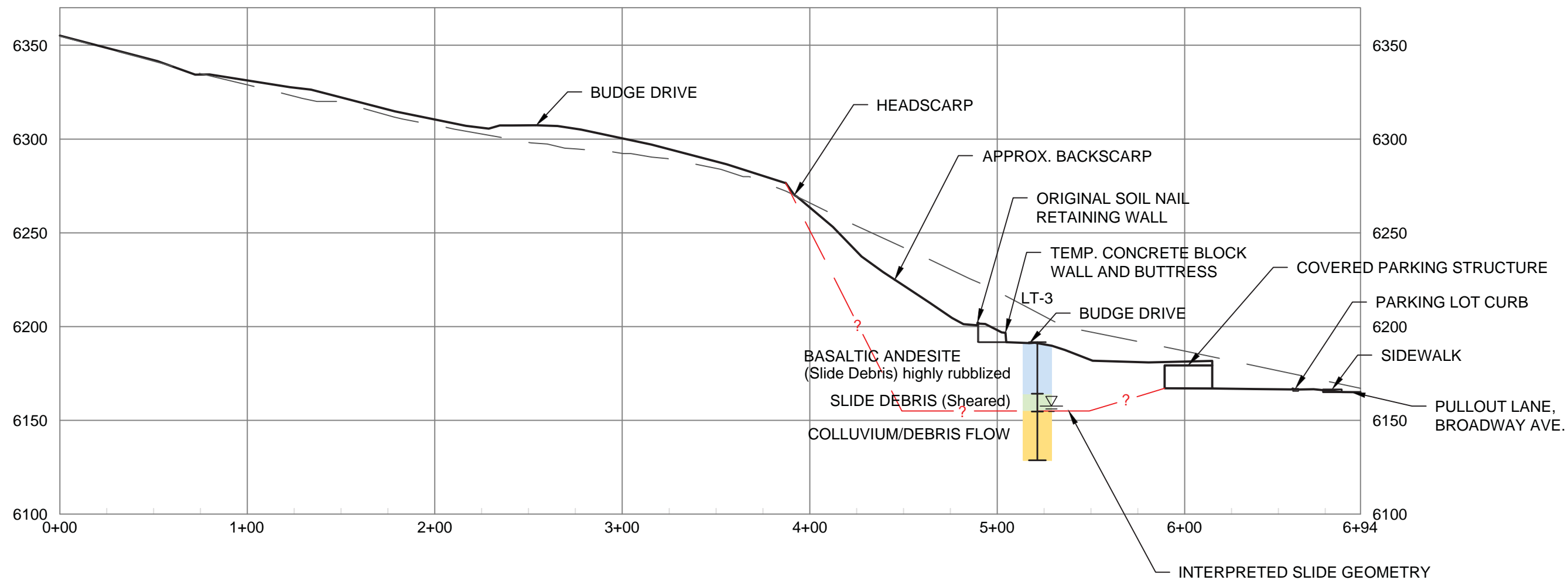
LANDSLIDE PHOTO

BUDGE DRIVE SLIDE
JACKSON, WYOMING

MAY 2014

PROJ. 2354

FIG. 4

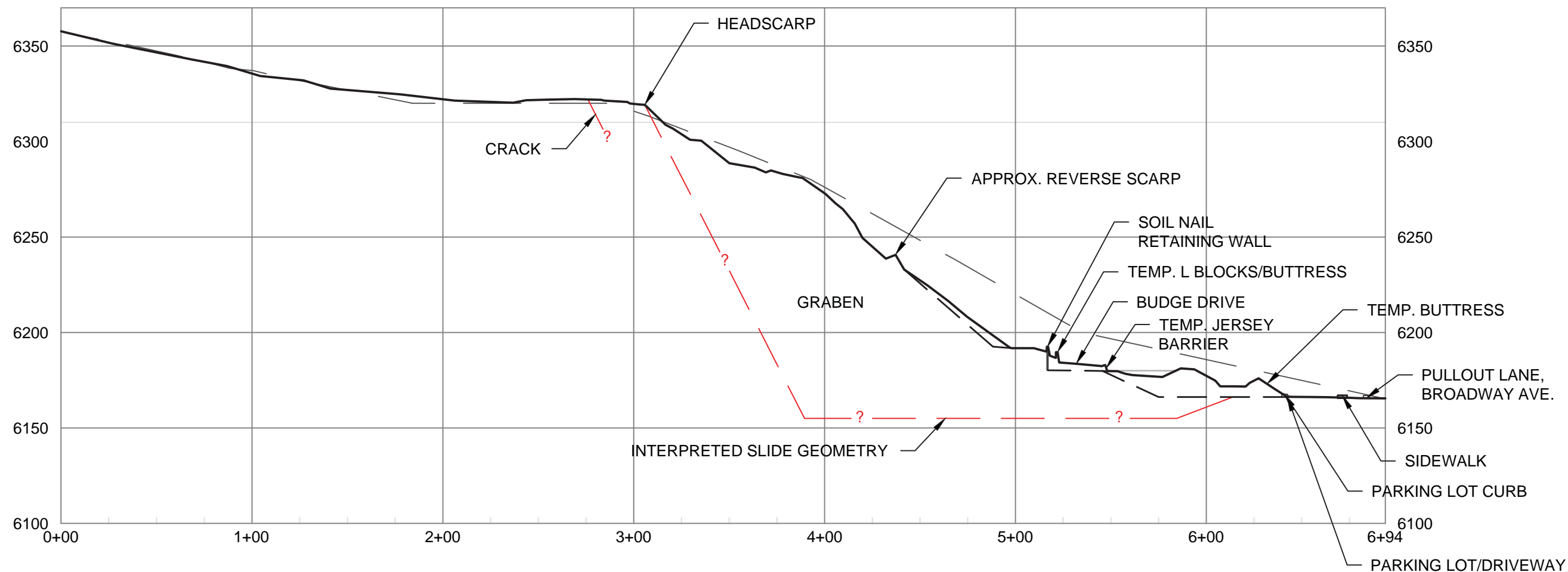


Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

LANDSLIDE
TECHNOLOGY
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Phone 503-452-1200 Fax 503-452-1528

GEOLOGIC CROSS SECTION
1
BUDGE DRIVE SLIDE
JACKSON, WYOMING

MAY 2014
PROJ. 2354
FIG. 6



LEGEND

— EXISTING GROUND LINE

— 1963 GROUND LINE

— 2013 GROUND LINE

▽ GROUNDWATER LEVEL (MAY 20, 2014)

• SHEAR ZONE MEASURED IN INCLINOMETER

0 60 120

SCALE IN FEET

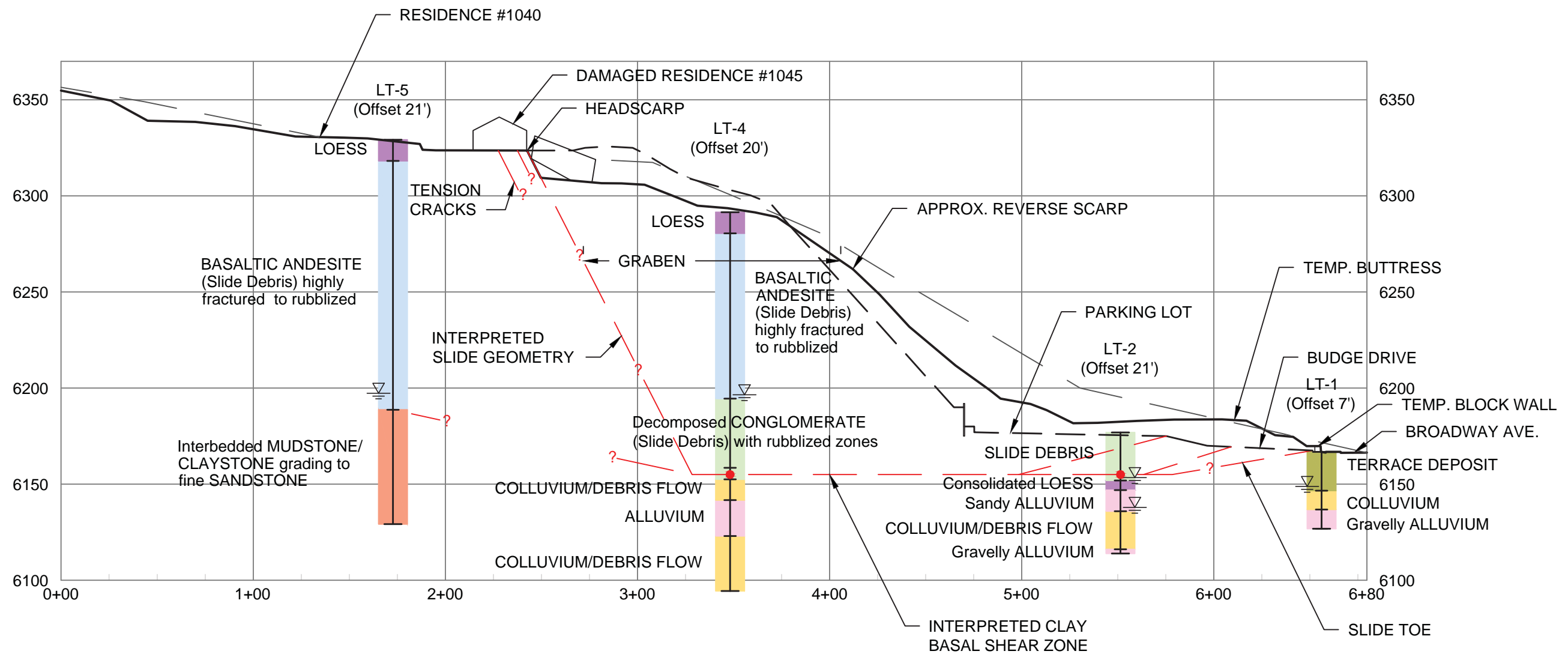
Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

LANDSLIDE
TECHNOLOGY
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Phone 503-452-1200 Fax 503-452-1528

GEOLOGIC CROSS SECTION
2
BUDGE DRIVE SLIDE
JACKSON, WYOMING

MAY 2014
PROJ. 2354
FIG. 7

2254/BDS-Section 1-5.dwg NAU

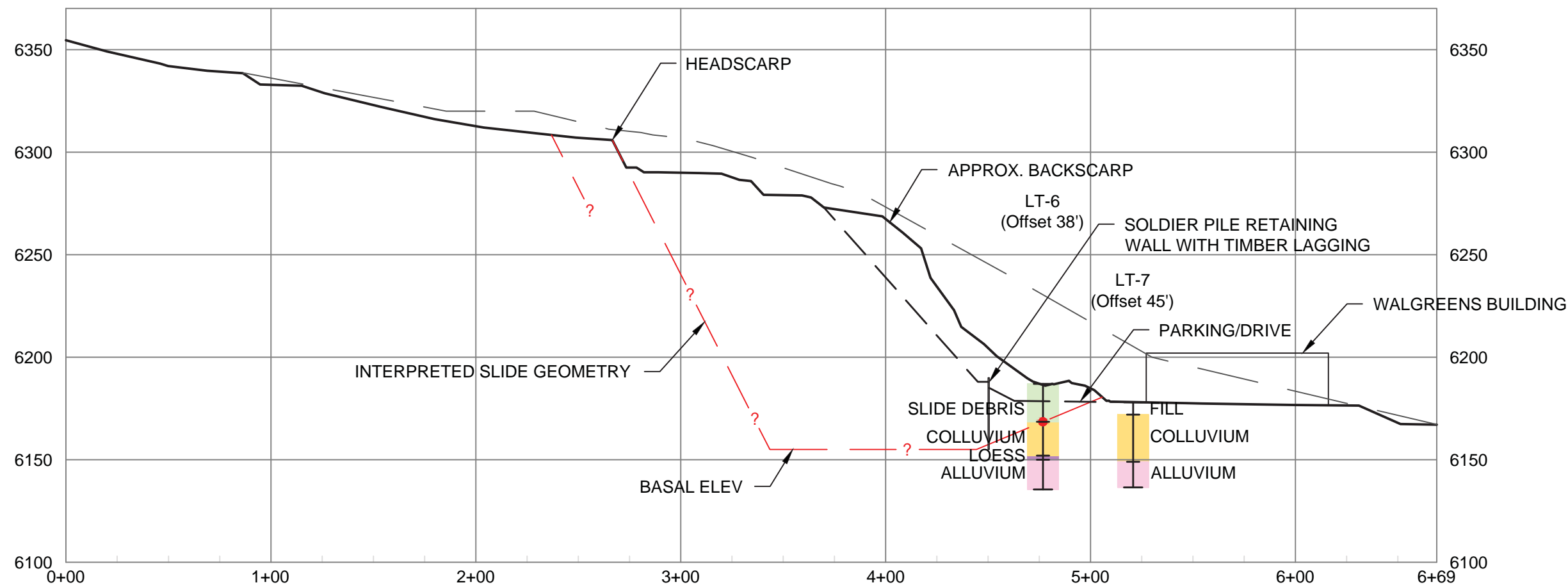


- LEGEND**
- EXISTING GROUND LINE
 - - - 1963 GROUND LINE
 - - - 2013 GROUND LINE
 - ▽ GROUNDWATER LEVEL (MAY 20, 2014)
 - SHEAR ZONE MEASURED IN INCLINOMETER



Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

<p>LANDSLIDE TECHNOLOGY 10250 S.W. Greenburg Road, Suite 111 Portland, Oregon 97223 Phone 503-452-1200 Fax 503-452-1528</p>	GEOLOGIC CROSS SECTION		MAY 2014
	3		PROJ. 2354
	BUDGE DRIVE SLIDE		FIG. 8
	JACKSON, WYOMING		



- LEGEND**
- EXISTING GROUND LINE
 - - - 1963 GROUND LINE
 - - - 2013 GROUND LINE
 - ▽ GROUNDWATER LEVEL (MAY 20, 2014)
 - SHEAR ZONE MEASURED IN INCLINOMETER

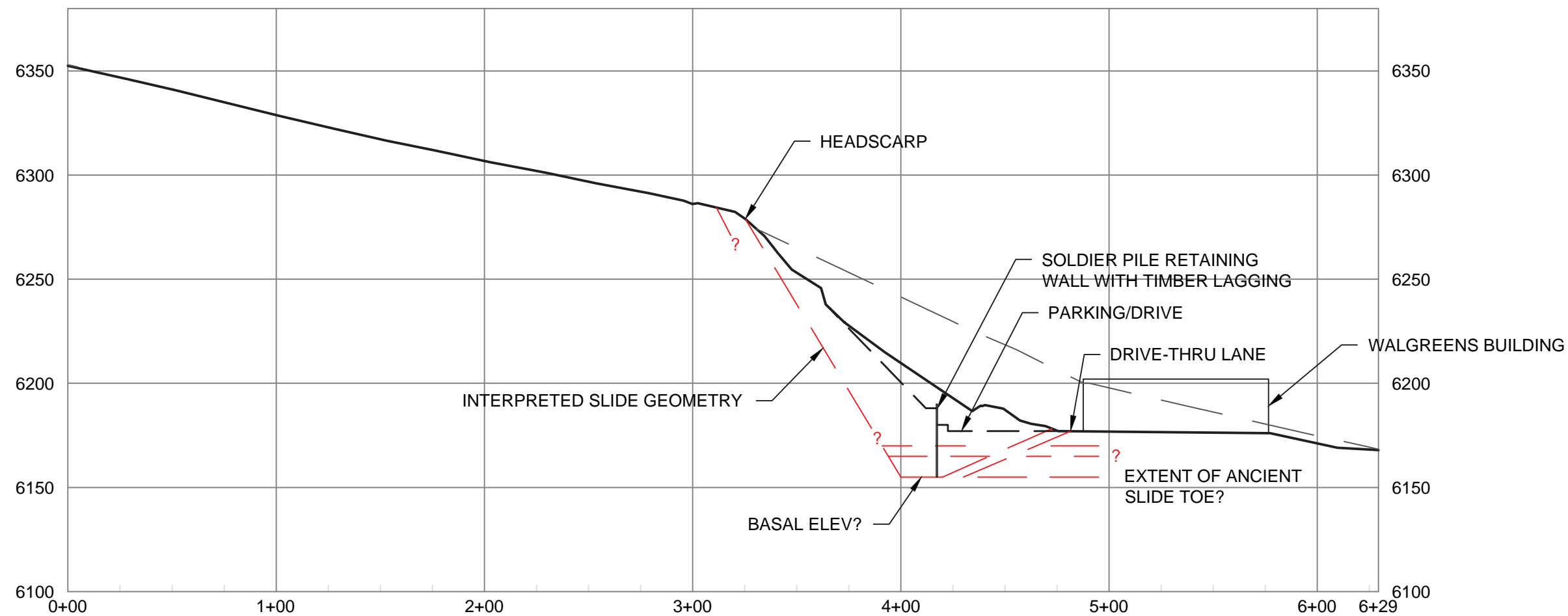
0 60 120
SCALE IN FEET

Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

LANDSLIDE
TECHNOLOGY
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Phone 503-452-1200 Fax 503-452-1528

GEOLOGIC CROSS SECTION
4
BUDGE DRIVE SLIDE
JACKSON, WYOMING

JUN 2014
PROJ. 2354
FIG. 9



LEGEND

— EXISTING GROUND LINE

— 1963 GROUND LINE

- - - 2013 GROUND LINE

▽ GROUNDWATER LEVEL (MAY 20, 2014)

• SHEAR ZONE MEASURED IN INCLINOMETER

0 60 120

SCALE IN FEET

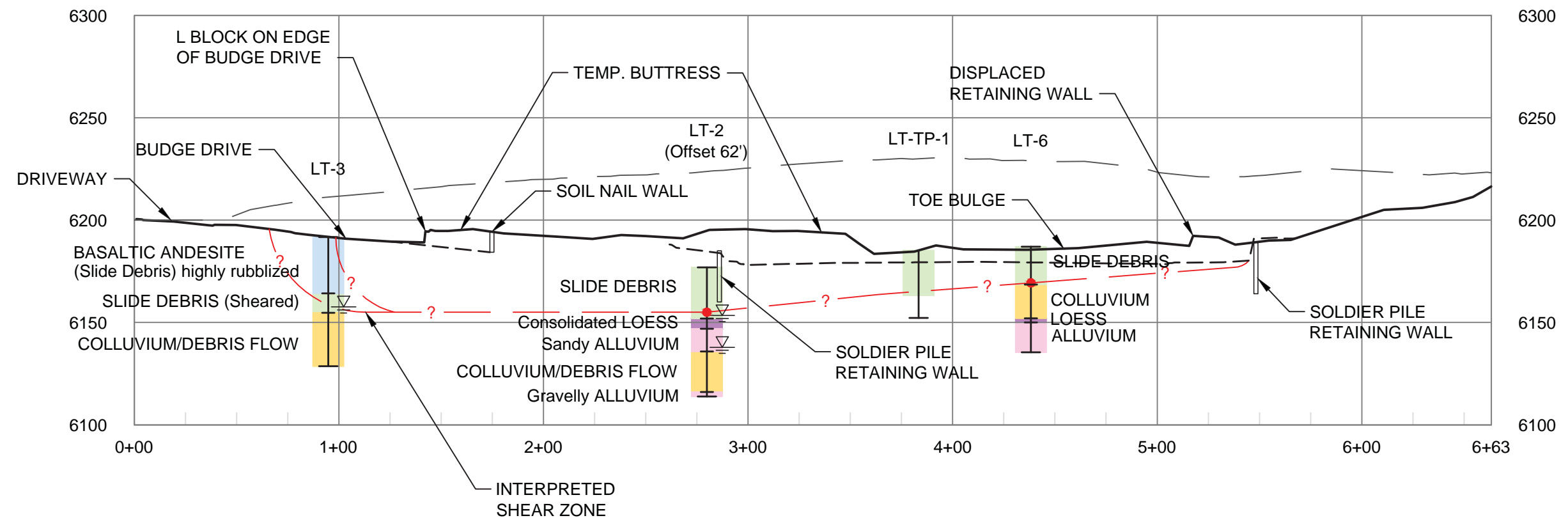
Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

LANDSLIDE
TECHNOLOGY
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Phone 503-452-1200 Fax 503-452-1528

GEOLOGIC CROSS SECTION
5
BUDGE DRIVE SLIDE
JACKSON, WYOMING

MAY 2014
PROJ. 2354
FIG. 10

2254/BDS-Section 1-5.dwg NAU



LEGEND

— EXISTING GROUND LINE

--- 1963 GROUND LINE

--- 2013 GROUND LINE

▽ GROUNDWATER LEVEL (MAY 20, 2014)

• SHEAR ZONE MEASURED IN INCLINOMETER

0 60 120

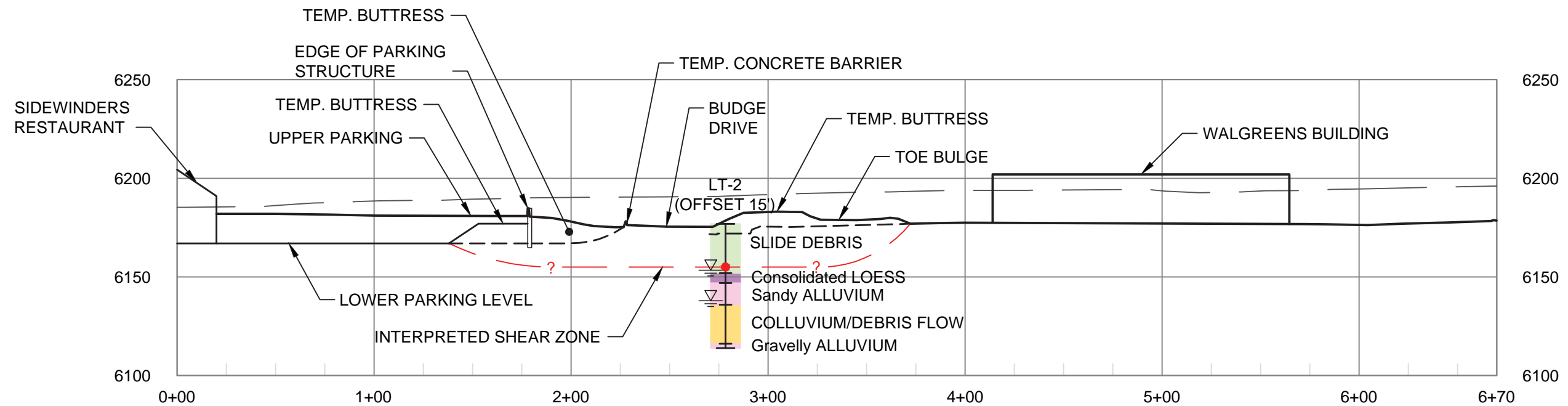
SCALE IN FEET

Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

LANDSLIDE
TECHNOLOGY
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Phone 503-452-1200 Fax 503-452-1528

GEOLOGIC CROSS SECTION
6
BUDGE DRIVE SLIDE
JACKSON, WYOMING

JUN 2014
PROJ. 2354
FIG. 11



- LEGEND**
- EXISTING GROUND LINE
 - - - 1963 GROUND LINE
 - . - 2013 GROUND LINE
 - ▽ GROUNDWATER LEVEL (MAY 20, 2014)
 - SHEAR ZONE MEASURED IN INCLINOMETER

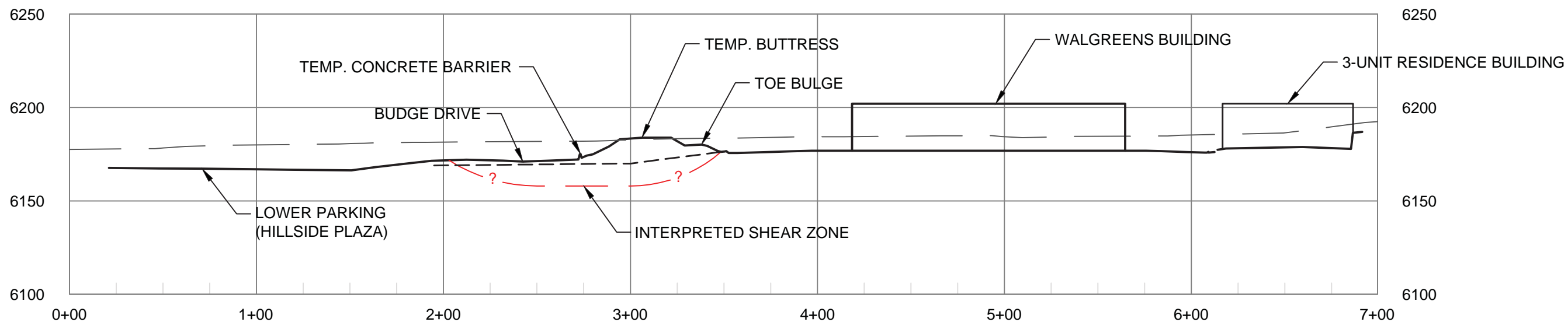
0 60 120
SCALE IN FEET

Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

LANDSLIDE
TECHNOLOGY
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Phone 503-452-1200 Fax 503-452-1528

GEOLOGIC CROSS SECTION
7
BUDGE DRIVE SLIDE
JACKSON, WYOMING

MAY 2014
PROJ. 2354
FIG. 12



LEGEND

- EXISTING GROUND LINE
- 1963 GROUND LINE
- - - 2013 GROUND LINE
- ▽ GROUNDWATER LEVEL (MAY 20, 2014)
- SHEAR ZONE MEASURED IN INCLINOMETER

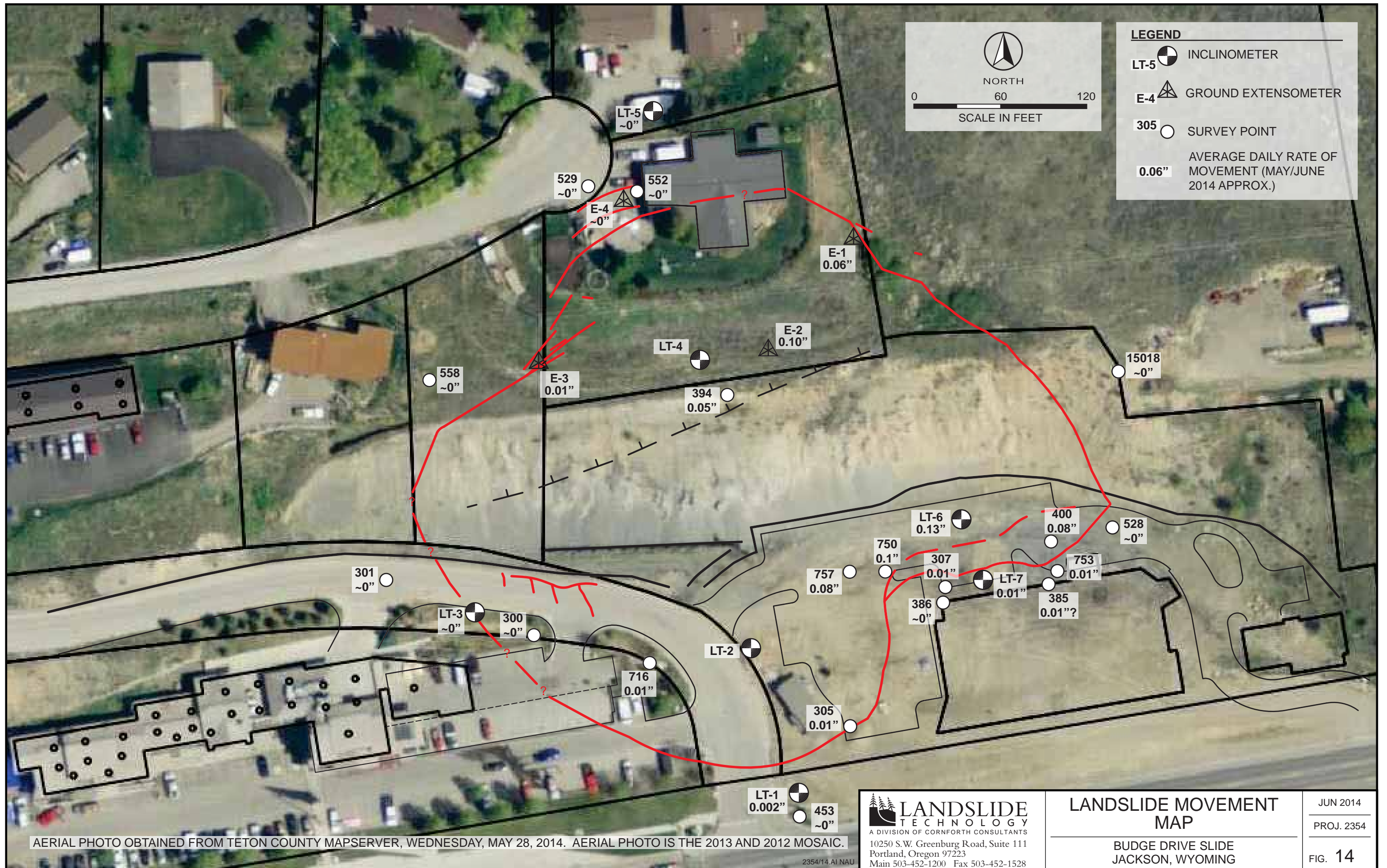
0 60 120
SCALE IN FEET

Surface geometry is based on survey data and cross sections prepared by Jorgensen Associates.

LANDSLIDE
TECHNOLOGY
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Phone 503-452-1200 Fax 503-452-1528

GEOLOGIC CROSS SECTION
8
BUDGE DRIVE SLIDE
JACKSON, WYOMING

MAY 2014
PROJ. 2354
FIG. **13**



AERIAL PHOTO OBTAINED FROM TETON COUNTY MAPSERVER, WEDNESDAY, MAY 28, 2014. AERIAL PHOTO IS THE 2013 AND 2012 MOSAIC.

2354/14.AI NAU

LANDSLIDE TECHNOLOGY
A DIVISION OF CORNFORTH CONSULTANTS
10250 S.W. Greenburg Road, Suite 111
Portland, Oregon 97223
Main 503-452-1200 Fax 503-452-1528

LANDSLIDE MOVEMENT MAP

BUDGE DRIVE SLIDE
JACKSON, WYOMING

JUN 2014
PROJ. 2354
FIG. 14